

EXHIBIT T

Comprehensive Noise Analysis Summary Report

Facilities Located at 2005 & 2015 N. McDonald



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I. Introduction

In late December 2017, Code Enforcement Staff received a complaint regarding noise originating from Cowtown Redi-Mix, a concrete batch facility located at 2015 S. McDonald Street that had recently opened for business. This was the first noise complaint ever received by Code Staff regarding any of the three concrete-related businesses located on the east side of South McDonald Street at Stewart Road.

Additional noise complaints followed early in 2018. These complaints named two additional businesses located at 2005 S. McDonald Street, L'Hoist North America of Texas and TXI Operation DBA Martin Marietta as contributing to a portion of the noise issues being described. The location of these three businesses are more fully depicted in Figure 1. Collectively, these three businesses shall be referenced as "the Facility" throughout this report.

Figure 1: Facility Locations



The majority of the early complaints were received from residents of the McKinney Greens subdivision which is located to the west and north of the Facility. Later complaints

were also received from residents of Villa View Mobile Home Park located at 2201 S. McDonald Street, immediately south of Cowtown Redi-Mix. The location of these two neighborhoods are more fully depicted by Figure 2.

Figure 2: Complainant Locations



It was determined that in order to address citizen complaints and verify compliance with applicable regulations, Staff would need to complete a comprehensive noise analysis of the facilities in order to determine if a violation of an applicable city code actually existed.

II. Purpose

The purpose of this comprehensive noise analysis was to determine if the sound pressure level (decibels) of any of the facilities referenced in complaints received exceeded the decibel limits specified in specific octave band groups designated within Section 146-134(1)(a) (Octave Band Frequencies) of the City of McKinney Code of Ordinances which will be referenced as "the Code" throughout this report. Additionally, verification of compliance with Article V (Noise) of Chapter 70 was also sought.

III. Regulations

Section 146-134 (Performance Standards) of the Code includes specific regulations governing maximum allowable decibel ranges. These regulations govern all land uses in all zoning districts and require conformance in a variety of areas including, but not limited to, noise and construction hours. In order to determine whether a noise violation existed, Staff compared their findings to the allowed decibel levels within the Code. Additionally, Article V (Noise) of Chapter 70 of the Code of Ordinances also addresses noise and prohibits certain disturbances in specific areas.

The Code states, in part:

Sec. 146-134. - Performance Standards.

All uses in all districts shall conform in operation, location, and construction to the performance standards hereinafter specified.

(1) *Noise. At no point at the bounding property line of any use shall the sound pressure level of any operation or plant exceed the decibel limits specified in the octave band groups designated in the following table:*

a. Octave band frequencies.

<i>Octave band (cycles per second)</i>	<i>Maximum permitted sound pressure level (decibels)</i>
<i>20—75</i>	<i>86</i>
<i>75—150</i>	<i>76</i>
<i>150—300</i>	<i>70</i>
<i>300—600</i>	<i>65</i>
<i>600—1,200</i>	<i>63</i>
<i>1,200—2,400</i>	<i>58</i>
<i>2,400—4,800</i>	<i>55</i>
<i>4,800—10,000</i>	<i>53</i>

b. *Corrections. The following corrections shall be made to the table of octave band, decibel limits in determining compliance with the noise level standards:*

<i>Type of operation or character of noise</i>	<i>Correction in decibels</i>
<i>Noise source operates less than 20 percent of any one-hour period</i>	<i>Plus 5*</i>
<i>Noise source operates less than 5 percent of any one-hour period</i>	<i>Plus 10*</i>
<i>Noise source operates less than 1 percent of any one-hour period</i>	<i>Plus 15*</i>
<i>Noise of impulsive character (hammering, etc.)</i>	<i>Minus 5 Noise of periodic character</i>
<i>(hum, screech, etc.)</i>	<i>Minus 5</i>
<i>Noise present at night</i>	<i>Minus 7</i>

**Apply one correction only.*

c. *Daytime hours. Daytime shall refer to the hours between 6:00 a.m. and 9:00 p.m. on any given day.*

d. *Boundary property line. The bounding property line shall be interpreted as being at the far side of any street, alley, stream, or other permanently dedicated open space from the noise source when such open space exists between the property line of the noise source and adjacent property. When no such open space exists, the common line between two parcels of property shall be interpreted as the bounding property line.*

e. *Noise measurement. Measurement of noise shall be made with a sound level meter or octave band analyzer meeting the standards prescribed by the American Standards Association.*

f. *Exemptions. The following uses and activities shall be exempt from the noise level regulations herein specified:*

1. *Noises not directly under control of the property user;*
2. *Noises emanating from construction and maintenance activities during daytime hours;*
3. *Noises of safety signals, warning devices, and emergency pressure relief valves; and*
4. *Transient noise of moving sources such as automobiles, trucks, airplanes, and railroads.*

Sec. 70-119. - Definitions.

...

Noise disturbance means any sound which annoys or disturbs, or which causes or tends to cause an adverse psychological or physiological effect upon, the sensibilities of a reasonable, prudent, adult person; and unreasonably loud or disturbing noise which renders the enjoyment of life or property uncomfortable or interferes with public peace and comfort.

Noise disturbance per se means not requiring extraneous evidence or support to establish the existence of a noise disturbance.

...

Quiet zone means any territory adjacent to or within a distance of 500 feet from the nearest property line of (1) any residential district or (2) any real property on which a school, college, hospital, clinic, library or other noise-sensitive facility is situated.

...

Sec. 70-120. - Specific noise disturbance prohibited.

...

- (b) The following includes, but is not limited to, activities which can create unreasonably loud or disturbing noises in violation of this article, including activities which are noise disturbances per se, unless an exemption exists or a permit of variance was first obtained as provided in section 70-122, or the noise emitted is consistent with or within the parameters of section 146-134.

...

(14) Quiet zone. Creating a noise disturbance on any street adjacent to any school, hospital, clinic, library or other noise sensitive facility.

IV. Methodology

- A. Equipment. In order to ensure accurate noise measurements, Staff upgraded existing sound metering equipment. A SVAN 971 Sound Level Meter and Analyzer was purchased for use in this study and to assist in resolving future noise complaints. This instrument was chosen following discussions with sound testing professionals based on factors including, but not limited to ease of use, accuracy, and its ability to be programmed with the specifications contained within the Code.
- B. Testing Sites. Various criteria were considered when selecting the sites for noise testing. In order to get a representative sample of the noises occurring in the area, three sites were ultimately identified. These sites are more fully depicted by Figure 3.

Figure 3: Location of Testing Sites 1-3



In accordance with the provisions of Section 146-134(d) of the Code, testing occurred at the bounding property line of the Facility.

In this instance, State Highway 5 (McDonald Street) served as the “street” between Sites 1 and 2 and adjacent properties. Sites 1 and 2 were set up on the west side of Highway 5 across from the Facility; Site 1 just north of Stewart Road and Site 2 located south of Stewart Road. These two sites were located within the public right-of-way for McDonald Street but far enough off the roadway's pavement to not create a hazard for drivers and to be safely accessible to Staff during monitoring. A third testing site (Site 3) was established on the south side of Cowtown Redi-Mix within Villa View Mobile Home Park. Since Cowtown Redi-Mix is directly adjacent to the Villa View community, the testing site was set up as close as possible to the property line without negatively impacting the residents and providing Staff with a safe location to monitor the testing.

- C. Testing Times. Careful consideration was given to the days and times that testing would be conducted. The hours of operation for the Facility varied based upon demand for product from the individual businesses. Review of the complaints received by Staff indicated the need for an early morning testing period when traffic along State Highway 5 was light and least likely to create interference with possible noise from the Facility operations. A testing period of 3:00 a.m. to 5 a.m. was selected. It was anticipated that this window would identify noise as the Facility started up and began production for the day. Additional testing periods from 7:30 a.m. to 8:30 a.m. and 4:30 p.m. to 5:30 p.m. were identified to provide information on noise levels while the Facility was in full operation with the highest volume of traffic entering and exiting the Facility. Testing was conducted Monday through Thursday at each of the three sites, at each of the three identified testing times. Testing was canceled on days when wind speeds were greater than 15 mph or during any rain event. A total of 44 individual sound tests were compiled between the three testing locations.
- D. Miscellaneous. In addition to the data recorded through the noise meter, Staff also made a video recording during the full length of each test. An Apple iPad was placed on the dashboard of the City vehicle which was focused on the Facility and noise meter during the testing. The vehicle's engine was off and no noteworthy sound levels originated from inside the vehicle. This video provided additional documentation relative to the cause of some of the noises that raised or peaked decibel levels in the recorded data. Staff also maintained a minute-by-minute, noise-by-noise log of what was seen and heard during testing. This data was also used in categorizing various spikes in the decibel levels that were identified on the recorded data.

V. Findings

As previously mentioned, noise metering occurred 44 times across three testing sites and three testing windows throughout the day. Based on the requirements of the Code, each testing window measures data across eight decibel ranges. For each testing window, some 16 pieces of data were monitored. These 16 data points include the average and peak decibel range for each of the 8 octave bands. Together, these data points helped to identify which tests required further investigation. Additionally, Staff compiled some 2,073 handwritten observations detailing noteworthy sound increases across the 44 metering windows and approximately 60 hours of audio and video recordings. In order to produce meaningful conclusions from this data it first had to be compiled in a format that was easily reviewable.

To accomplish this, Staff created a spreadsheet on which the octave band data was documented for each testing site. Additionally, all Staff observations were also documented in this spreadsheet format. Using these spreadsheets, Staff was able to cross-reference observations to verify when recorded sound exceeded permissible decibel levels.

Due to the fact that sound level measurement and terminology has changed since the Code was written, Staff evaluated the frequency of sounds in Hertz Bands (Hz) instead of cycles per second as this measurement is identified in the Code. Staff identified 13 testing site/times where repeated average sound measurements exceeded the Code allowances. Specifically, in the following octave bands: 500Hz, 1000Hz, 2000Hz, and 4000Hz. These octave bands correspond to Code octave bands in cycles per second: 300-600; 600-1,200; 1,200-2,400; and 2,400-4,800. These instances only occurred at Site 1 and Site 2 (See Figure 4). Instances where noise levels exceeded the Code's allowances are shown in red.

Figure 4: Average Decibel Readings in Each Octave Band, by Recording Site and Time Slot

Row Labels	Average of Avg 500 Hz	Average of Avg 1000 Hz	Average of Avg 2000 Hz	Average of Avg 4000 Hz
- Site 1	64.70625	66.3875	61.83125	54.125
3:00 a.m.	63.21666667	62.06666667	56.68333333	52.66666667
4:30 p.m.	64.475	68	63.775	53.375
7:30 a.m.	66.35	69.63333333	65.68333333	56.08333333
- Site 2	61.86923077	67.13076923	64.29230769	53.76153846
3:00 a.m.	54.275	59.575	56.625	46.15
4:30 p.m.	66.18	70.76	67.06	56.56
7:30 a.m.	64.075	70.15	68.5	57.875
- Site 3	50.17333333	47.54	46.64666667	40.56666667
3:00 a.m.	48.48	44.08	43.04	36.9
4:30 p.m.	51.6	50.36	47.98	43.48
7:30 a.m.	50.44	48.18	48.92	41.32
Grand Total	58.91363636	60.18181818	57.38181818	49.39545455

Instances where noise levels exceeded the Code's allowances generally occurred during a.m. peak traffic (7:30 a.m. to 8:30 a.m.) and p.m. peak traffic (4:30 p.m. to 5:30 p.m.) time periods. These violations could not be attributed to Facility operations due to the noteworthy increase of recorded traffic noise. The complete table reflecting all of the recorded data including periods where measured noise did not exceed the Code's allowances is attached as [Appendix A](#).

Most of the 1,641 written observations made by Staff for testing Sites 1 and 2 during peak traffic times were characterized as vehicle-specific noises (See Figure 5). Approximately 88% of observations are noted as 18 wheeled trucks, loud cars and trucks, large trucks / cement trucks; and approximately 12% of noises included motorcycles, regular vehicles, emergency vehicles, nature noises, horns, warning devices, and lawn equipment. Pursuant to the provisions of the Code, all of these types of noises are exempt from the noise level regulations and cannot be attributed to the Facility. The small number of Facility-related noises that were able to be identified and isolated did not exceed permissible levels.

Figure 5: Written Observations Sites 1 and 2

Sites 1 & 2	Count of Noise Type	Percent of Total
18 Wheeled Vehicle	556	33.9%
Large Truck / Cement Truck	532	32.4%
Loud Car / Truck	386	23.5%
Motorcycle	80	4.9%
Regular Vehicle	53	3.2%
Emergency Vehicle / Airplane	20	1.2%
Nature	6	0.4%
Horn	3	0.2%
Facility Noise	3	0.2%
Backup Beeping	1	0.1%
Lawn Equipment	1	0.1%
Grand Total	1641	100.00%

Results from Site 3 represent a more accurate perspective of the noises generated by the Facility due to the Site's isolation, or buffering, from the vehicle-specific noises generated from State Highway 5 (McDonald Street). A total of 431 written observations were logged at this testing location (See Figure 6). Site 3 did not produce any noise violations per the Code. While there is a constant low-pitched sound that is associated with the operation of the Facility, the octave band measurements were within acceptable limits in all frequencies even when applying the subtractive correction (-7 decibels) for "noises present at night" as stated within the Code for all testing during the 3:00 a.m. to 5:00 a.m. testing times. The majority of noises recorded at Site 3 are characterized as neighborhood-specific noise, regular vehicles, loud cars / trucks, emergency vehicles, lawn equipment, people, a motorcycle, and three instances of Facility-related noise which

did not violate the Code and could not be attributed to any one particular business operation.

Figure 6: Written Observations for Site 3

Site 3	Count of Noise Type	Percent of Total
Regular Vehicle	225	52.2%
Nature	70	16.2%
Loud Car / Truck	60	13.9%
Backup Beeping	40	9.3%
Horn	9	2.1%
People	7	1.6%
Emergency Vehicle / Airplane	7	1.6%
Large Truck / Cement Truck	7	1.6%
Lawn Equipment	3	0.7%
Facility Noise	3	0.7%
Grand Total	431	100.00%

VI. Conclusion

The general area along State Highway 5 (McDonald Street) centered from Crestwood (interior street within Villa View Mobile Home Park) to Stewart Road is a highly traveled roadway with a large volume of commercial vehicles. In fact, recorded traffic volumes from 2015 show that an average of approximately 41,000 vehicles using this portion of roadway each day. Those traffic volumes have surely increased over time with McKinney's continued growth.

After reviewing the 44 recorded testing sessions and more than 2,000 written observations, data verified that at Sites 1 and 2 the average decibel level in multiple octave bands exceed the permissible level allowed by the Ordinance. However, the sources of the noise violations were verified to be from traffic or transient noise and could not be isolated or associated to the Facility. Site 3 was most isolated from traffic and transient noises and provided the most transparent collection of data. At this location, noises from Facility operations were within allowable decibel ranges within all octave bands.

Additionally, Staff investigated the proximity of the Facility to adjacent properties that are zoned and used for residential properties. The Code identifies areas defined as quiet zones. These quiet zones are intended to prohibit noise disturbances from occurring in close proximity to residential uses. The investigation and application of these regulations uncovered the fact that it is impossible to know exactly if a noise disturbance will occur before a land use is in full operation therefore it is nearly impossible to utilize the quiet zone regulations to prohibit a use from developing adjacent to residential uses. Upon such a time where noise disturbances (which are inherently subjective and extremely difficult to cite and prosecute) did occur, the use would have already been legally permitted to operate and removing or otherwise shuttering the use would be legally problematic. As such, these regulations could not be reasonably enforced and Staff recommends that these regulations be revisited in the future to be more objective in nature.

Based upon Staff's findings, at this time there is no evidence to substantiate complaints that noise from the Facility violates the Code.

If in the future if violations are verified, the Facility would be required to mitigate noise by buffering or another accepted industry standard.

Row Labels	Average of Avg 31.5 Hz	Average of Avg 63 Hz	Average of Avg 125 Hz	Average of Avg 250 Hz	Average of Avg 500 Hz	Average of Avg 1000 Hz	Average of Avg 2000 Hz	Average of Avg 4000 Hz	Average of Avg 8000 Hz
- Site 1	67.75625	68.36675	66.775	64.45625	64.70625	66.3875	61.83125	54.125	45.2875
3:00 a.m.	65.23333333	63.95	62.56666667	61.88333333	63.21666667	62.06666667	56.68333333	52.66666667	44.66666667
4:30 p.m.	69.325	70.85	68.925	63.975	64.475	68	63.775	53.375	43.525
7:30 a.m.	69.23333333	71.13333333	69.55	67.35	66.35	69.63333333	65.68333333	56.08333333	47.08333333
- Site 2	68.46923077	69.03076923	67.86923077	64.77692308	61.86923077	67.13076923	64.29230769	53.76153846	43.00769231
3:00 a.m.	65.475	65.3	61.15	57.575	54.275	59.575	56.625	46.15	34.6
4:30 p.m.	71.04	71.16	71.02	69.4	65.18	70.76	67.08	56.56	46.3
7:30 a.m.	68.25	70.1	70.65	66.2	64.075	70.25	68.5	57.875	47.3
- Site 3	66.15333333	59.88666667	57.8	52.77333333	50.17333333	47.54	46.64666667	40.56666667	31.71333333
3:00 a.m.	65.5	55.1	51.38	49.7	48.48	44.08	43.04	36.9	27.78
4:30 p.m.	69.34	64.02	61.26	55.54	51.6	50.36	47.98	43.48	36.6
7:30 a.m.	63.62	60.54	60.76	53.08	50.44	48.18	46.92	41.32	30.76
Grand Total	67.42045455	65.67272727	64.03863636	60.56818182	58.91363636	60.18181818	57.38181818	49.39545455	39.98636364

See graph cells: F5, F8, G4, G5, G8, G9, H4, H5, H8, H9, I5, I8, and I9.

This table shows an average decibel level of all recordings grouped by each recording site and time slot (column A), in each of the octave bands (columns B-J). Red cell and text color indicates a decibel level above the maximum permissible per the city ordinance. All readings not highlighted in red were in compliance with the Code.

APPENDIX A